CLAIMS

1. An amorphous carbon film, said film having a density of 2.8 g/cm^3 or greater and 3.3 g/cm^3 or less.

2. An amorphous carbon film according to claim 1, said film having a spin density of 1x10^{18} spins/cm^3 or greater and 1x10^{21} spins/cm^3 or less.

3. An amorphous carbon film according to claim 1 or 2, wherein a concentration of carbon in the film is 99.5 at% or greater, a concentration of hydrogen in the film is 0.5 at% or less, a concentration of a rare gas element in the film is 0.5 at% or less.

4. An amorphous carbon film according to any one of claims 1 to 3, wherein said amorphous carbon film is essentially formed from carbon.

5. An amorphous carbon film according to any one of claims 1 to 4, wherein Knoop hardness is 3000 or greater 7000 or less.

6. An amorphous carbon film, comprising:

a mixed layer on a surface of a base material, said mixed layer containing portions of the base material and at least one substance selected from the group consisting of B, Al, Ti, V, Cr, Zr, Nb, Mo, Hf, Ta, and W, said mixed layer formed with a thickness of 0.5 nm or greater 10 nm or less; and

an amorphous carbon layer formed on top of said mixed layer.

7. An amorphous carbon film, comprising:

an amorphous carbon layer

an interlayer disposed between a base material and the amorphous

carbon layer, said interlayer containing at least one substance selected from the group consisting of B, Al, Ti, V, Cr, Zr, Nb, Mo, Hf, Ta, and W, and said interlayer having a thickness of 0.5 nm or greater 10 nm or less;

wherein on a base material side of said interlayer, there is a mixed layer which contains portions of the base material and the interlayer material and which has a thickness of 0.5 nm or greater and 10 nm or less.

8. An amorphous carbon film as described in claim 7, wherein:

said mixed layer and said interlayer have a combined thickness of 10 nm or less.

9. An amorphous carbon film according to any one of claims 6 to 8, wherein a thickness of said mixed layer is 0.5 nm or greater 5 nm or less.

10. An amorphous carbon film according to any one of claims 6 to 9, wherein an average oxygen concentration contained in said mixed layer or in said mixed layer and interlayer is 1 at% or less.

11. An amorphous carbon film, according to any one of claims 1 to 5,

an interface between a base material and said amorphous carbon layer, comprising any one of claims 6 to 10.

12. A method for manufacturing an amorphous carbon film according to any one of claims 1 to 11, comprising:

executing a sputter method or a cathode arc ion plating method or a laser ablation method; and

forming an amorphous carbon film with solid carbon as a raw material under an atmosphere which does not contain hydrogen.

13. A method for manufacturing an amorphous carbon film according to any one of claims 1 to 11, comprising:

executing a cathode arc ion plating method or laser ablation method, with solid carbon as raw material and under an atmosphere with a degree of vacuum of 0.05 Pa or lower; and

forming an amorphous carbon layer without introducing gas which contains hydrogen or rare gas.

14. A method for manufacturing an amorphous carbon film according to claim 12 or 13, wherein:

synthesizing said mixed layer by applying a negative bias voltage on said base material and using an ion injection method, plasma CVD method, sputter method, cathode arc ion plating method, or laser ablation method.

15. A method for manufacturing an amorphous carbon film according to claim 12 or 13, comprising:

synthesizing said mixed layer by applying a negative bias voltage on said base material and using an ion injection method, plasma CVD method, sputter method, cathode arc ion plating method, or laser ablation method under an atmosphere which contains rare gas.

16. An amorphous carbon film coated material, comprising:

being coated with an amorphous carbon film according to any one of claims 1 to 11.

17. An amorphous carbon film coated material, comprising:

being coated with an amorphous carbon film manufactured by a method

according to any one of claims 12 to 15.